EXAM PAPERS PRACTICE

Reproduction

Level: GSCE AQA 8461
Subject: Biology
Exam Board: Suitable for all boards
Topic: Reproduction
Level: Medium

This is to be used by all students preparing for AQA Biology 8461 foundation or higher tier but it is also suitable for students of other boards

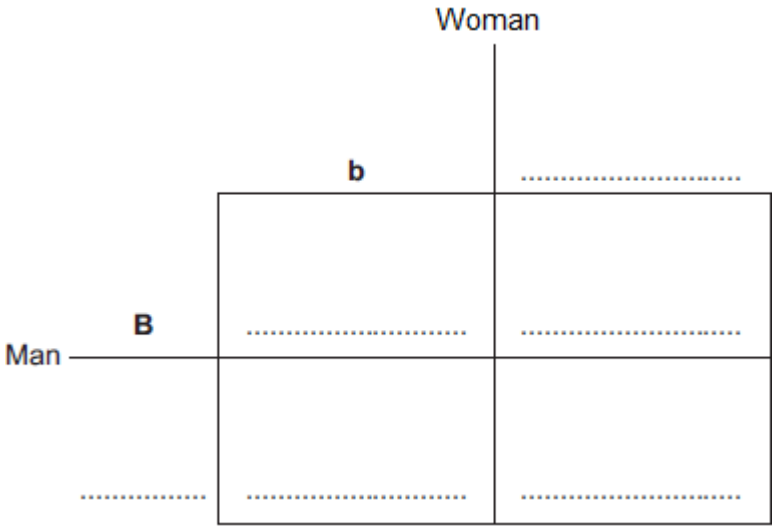
Q1. Eye colour is controlled by genes.

The dominant allele of the gene **(b)** produces brown eyes. The recessive allele (**b**) produces blue eyes.

A homozygous blue-eyed woman married a homozygous brown-eyed man.

All of their three children had brown eyes.

(a) (i) Complete the genetic diagram.



(2)

(ii) Give the reason why all of the children had brown eyes.

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(1)

(b) The couple's brown-eyed son and his brown-eyed partner had five children. Two of the children had blue eyes and three of the children had brown eyes.

Use a genetic diagram to show how two of their children came to have blue eyes.

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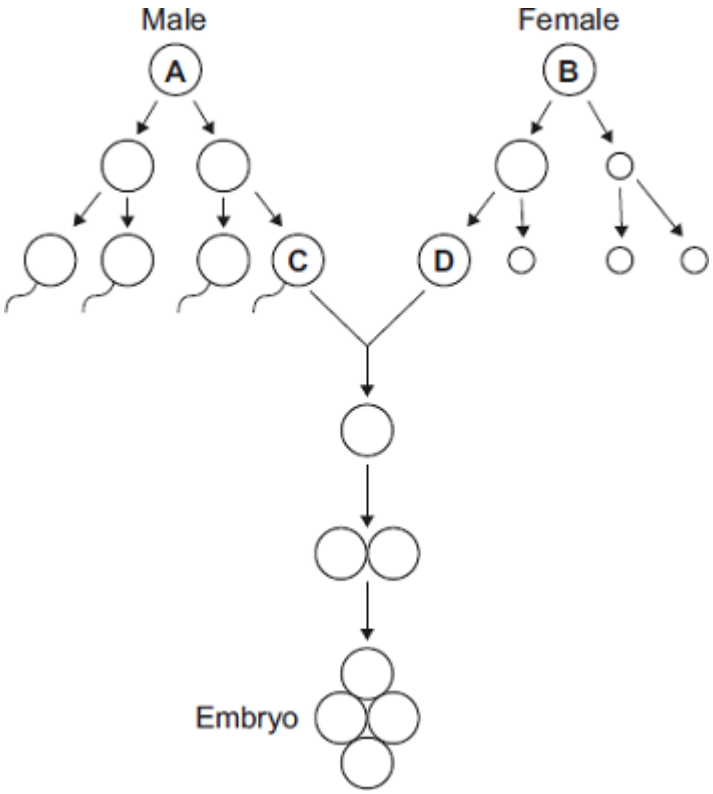
(3)
(Total 6 marks)

Q2. The diagram shows some of the cell divisions that occur during human reproduction.



(a) (i) Name the type of cell division that produces cell **D** from cell **B**.

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(1)

(ii) Which organ in the male body produces cell **C** from cell **A**?

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(1)

(b) (i) Cells **A** and **B** each contain 46 chromosomes.

How many chromosomes would there be in the nucleus of cell **C**? ☐

(1)

(ii) Why is it important that cell **C** has this number of chromosomes?

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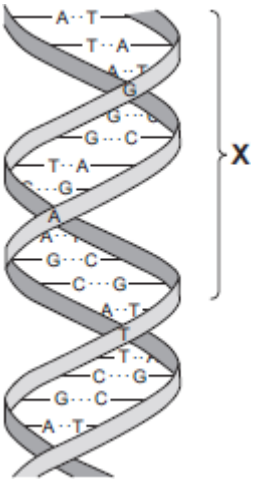
(2)
(Total 5 marks)

Q3. The diagram shows part of a DNA molecule.



(a) (i) In which part of an animal cell is DNA found?

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(1)

(ii) Complete the following sentence.

The letters **A**, **C**, **G** and **T** in the diagram represent four different compounds

called ..... .

(1)

(iii) One strand of the DNA, in the section labelled **X**, contains the following sequence of these compounds:

T A T G G G T C T T C G

How many amino acids would this section of the DNA code for? ☐

(1)

(iv) The section of DNA described in part **(a) (iii)** is a small part of a gene.

The sequence of compounds **A**, **C**, **G** and **T** in the gene is important.

Explain why.

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(2)

(b) *Read the following information about genetic engineering.*

The caterpillar of the European Corn Borer moth feeds on the fruits of maize (sweet corn). There is a chemical called Bt-toxin which is poisonous to the corn borer caterpillar but not to humans.

Scientists carried out the following steps.

1. The Scientists made a bacterial plasmid to which they added two genes:
   - **Bt** gene, which coded for production of the Bt-toxin
   - **kan**^{r} gene, which coded for resistance to an antibiotic called kanamycin.

2. They used this plasmid to produce genetically modified bacteria which could invade plant cells.

3. They mixed these genetically modified bacteria with pieces cut from maize leaves.

4. They placed the pieces of maize leaf on agar jelly in a Petri dish. The agar jelly contained the antibiotic, kanamycin. The kanamycin killed most of the pieces of maize leaf, but a few survived.

5. They took some cells from the surviving pieces of maize leaf and grew them in tissue culture.

The result was maize plants that now contained the **Bt** gene, as well as the **kan**^{r} gene, in all of their cells.

(i) What is a **plasmid** (Step 1)?

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(2)

(ii) Why did the scientists add **kanamycin** to the agar jelly (Step 4)?

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(2)

(iii) The scientists grew each Bt-maize plant from a single cell which contained the **Bt** gene.

Explain why **all** the cells in the Bt-maize plant contained the **Bt** gene.

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(2)

(iv) Kanamycin is an antibiotic.

Some scientists are concerned that the gene for kanamycin resistance has been put into maize.

Suggest why.

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(2)

(Total 13 marks)

Q4. Some genetic disorders are caused by alleles inherited from the parents.

(a) What are **alleles**?

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(1)

(b) Describe how embryos can be screened for the alleles that cause genetic disorders.

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(4)

(c) Polydactyly is a genetic disorder that leads to extra fingers or toes.

Polydactyly is caused by a dominant allele, **D**.

The photograph shows the hand of a person with polydactyly.

A man has polydactyly. His wife does not have polydactyly.

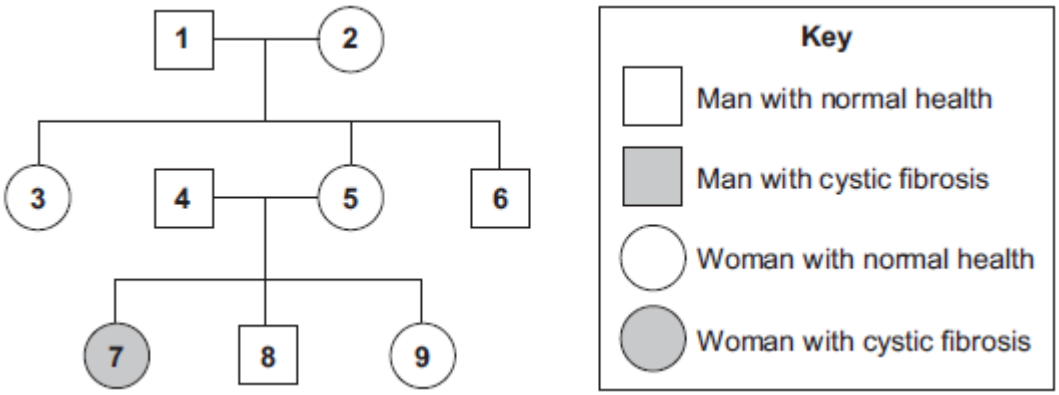
This couple's children have a 50% chance of having polydactyly.

Draw a genetic diagram to explain why.

(3)

(d) Cystic fibrosis is another genetic disorder. It is caused by a recessive allele.

The diagram shows the inheritance of cystic fibrosis in one family.



Woman **5** is pregnant with her fourth child.

What is the probability that this child will have cystic fibrosis?

Draw a genetic diagram to explain your answer.

Use the following symbols.

N = allele for normal health
n = allele for cystic fibrosis

(4)
(Total 12 marks)

Q5.DNA is the genetic material of human cells.

Figure 1 shows the structure of part of a DNA molecule.

Figure 1

(a) (i) Describe where DNA is found in a human cell.

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(2)

(ii) When a cell divides by mitosis the new cells are genetically identical.

What causes the cells to be genetically identical?

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(1)

(b) Many genes have different forms called alleles.

(i) A person has polydactyly (extra fingers or toes). Polydactyly is caused by a dominant allele.
What is the smallest number of copies of the dominant allele for polydactyly that could be found in a body cell of this person?

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(1)

(ii) Another person has cystic fibrosis. Cystic fibrosis (CF) is caused by a recessive allele.

How many copies of the recessive CF allele are there in a body cell of this person?

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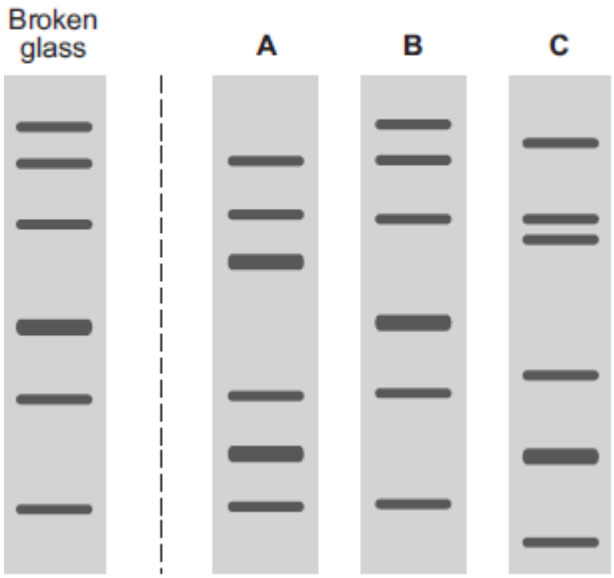
(1)

(c) A burglar broke into a house. The burglar cut his hand on some broken glass. Scientists extracted DNA from the blood on the broken glass.

The scientists analysed the DNA from the glass and DNA from three suspects, **A**, **B** and **C**. The scientists used a method called DNA fingerprinting.

Figure 2 shows the scientists' results.

Figure 2



Which suspect, **A**, **B** or **C**, is most likely to have been the burglar?

Tick (✓) **one** box.

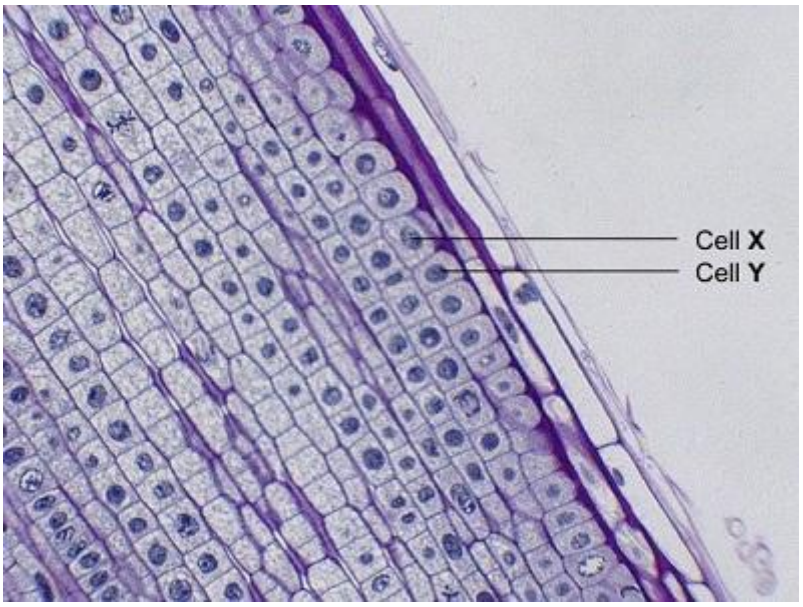
A ☐

B ☐

C ☐

(1)
(Total 6 marks)

Q6. The photograph shows some cells in the root of an onion plant.



By UAF Center for Distance Education [CC BY 2.0], via Flickr

(a) Cells **X** and **Y** have just been produced by cell division.

(i) Name the type of cell division that produced cells **X** and **Y**.

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(1)

(ii) What happens to the genetic material before the cell divides?

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(1)

(b) A gardener wanted to produce a new variety of onion.

Explain why sexual reproduction could produce a new variety of onion.

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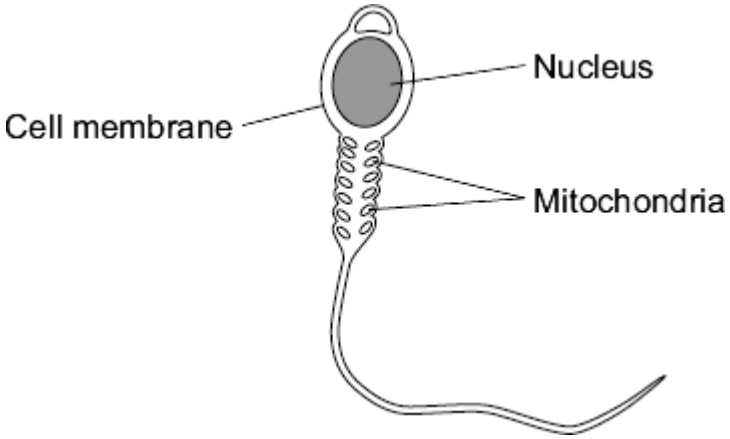
(3)
(Total 5 marks)

Q7. Cells in the human body are specialised to carry out their particular function.

(a) The diagram shows a sperm cell.



The sperm cell is adapted for travelling to, then fertilising, an egg.

(i) How do the mitochondria help the sperm to carry out its function?

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(1)

(ii) The nucleus of the sperm cell is different from the nucleus of body cells.

Give **one** way in which the nucleus is different.

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(1)

(b) Stem cells from human embryos are used to treat some diseases in humans.

Explain why.

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(2)

(Total 4 marks)

Q8. The photograph shows a zorse.

By Kumana @ Wild Equines [CC-BY-2.0], via Wikimedia Commons

A zorse is a cross between a male zebra and a female horse.
The zorse has characteristics of both parents.

(a) The zorse was produced by *sexual reproduction.*

(i) What is *sexual reproduction?*

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(1)

(ii) The zorse has characteristics of a zebra and a horse.
Why?

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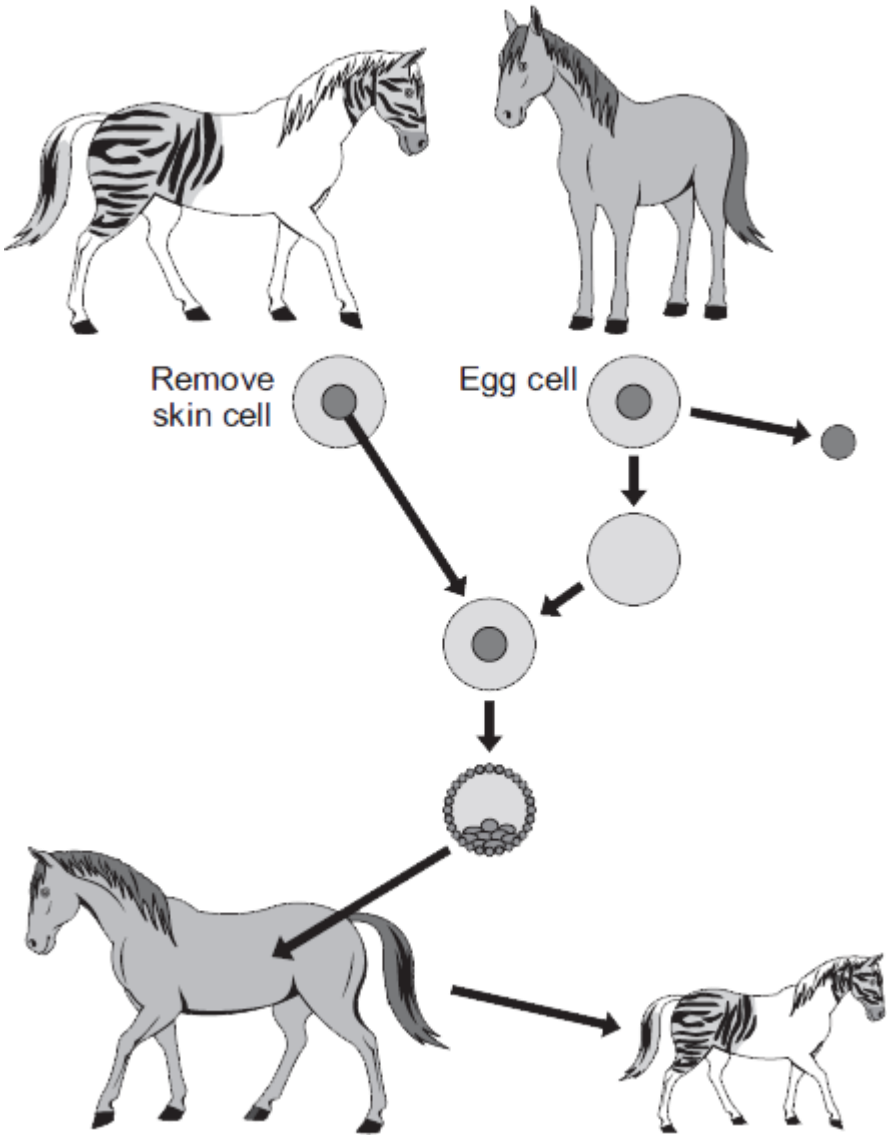
(2)

(b) Zorses are **not** able to breed.

Scientists could produce more zorses from this zorse by adult cell cloning.

The diagram shows how the scientists might clone a zorse.



In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Use information from the diagram and your own knowledge to describe how adult cell cloning could be used to clone a zorse.

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(6)
(Total 9 marks)